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PEREGRINE: An All Particle Monte Carlo code for Radiation Treatment Dose Calculation

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The vast majority of plans for the treatment of cancer with radiation are made with the assistance of computer programs that solve rough approximations of the transport equation. Errors in the solution often lead to low delivered dose resulting in survival of tumors or high delivered dose resulting in damage to healthy tissue and undesired complications. PEREGRINE is an effort to apply the Monte Carlo method, a method unhampered by the conventional approximations, to the calculation of dose to radiation treatment patients. To be useful in the field, the dose calculation must be efficient. PEREGRINE has been designed and written for the specific purpose of particle transport through the CT scan of each individual patient. Complete coupling of the transport and production of many particles (electrons, positrons, photons, neutrons, and protons) is accounted for. We will present the goals and aims of the PEREGRINE project, how they were accomplished, and examples of dose PEREGRINE dose calculations compared to conventional methods.

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